Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

1.-58. (Cancelled)

59. (Currently Amended) An analog front end for a digital subscriber line (DSL) modem, the analog front end comprising:

a single-ended receive channel configured to receive and process a differential input signal from a twisted pair telephone line that has been converted to a single-ended input signal;

a single-ended transmit channel;

a converter configured to convert the differential input signal from the twisted pair telephone line to the single-ended input signal for the receive channel, and convert a single-ended output signal from the transmit channel to a differential output signal for transmission on the twisted pair telephone line;

an automatic gain control amplifier having a single-ended input coupled to the single-ended receive channel, and a single-ended output, wherein the automatic gain control amplifier is configured to receive an automatic gain control signal;

a single-ended first filter coupled to the automatic gain control output; and

a single-ended second filter coupled to the transmit channel for filtering the single-ended output signal before conversion to the differential output signal for transmission on the twisted pair telephone line.

60-66. (Cancelled)

67. (Currently Amended) The analog front end of claim [[66]] 59, wherein the automatic gain control amplifier comprises a variable attenuator configured to attenuate the single-ended input signal.

68. (Currently Amended) The analog front end of claim 67, wherein the variable attenuator comprises a voltage controlled resistor.

69. (Currently Amended) The analog front end of claim 68, wherein the voltage controlled resistor comprises a field effect transistor.

70. (Currently Amended) The analog front end of claim 69, wherein the field effect transistor comprises a first part coupled to the automatic gain control amplifier, a second part coupled to a bias voltage, and a gate configured to receive a voltage to control the attenuation of the single-ended input signal.

71. (Currently Amended) The analog front end of claim 70, wherein the first part of the field effect transistor comprises a drain and the second part of the field effect transistor comprises a source.

72.-76. (Cancelled)

77. (Currently Amended) An analog front end for a digital subscriber line (DSL) modem, the analog front end comprising:

receive means for receiving a single-ended input signal, the single-ended input signal having been converted from a differential input signal from a twisted pair telephone line;

transmit means for transmitting a single-ended output signal;

converter means for converting the differential input signal from the twisted pair telephone line to the single-ended input signal for the receive means, and converting the single-ended output signal from the transmit means to a differential output signal for transmission on the twisted pair telephone line;

an automatic gain control amplifier means having a single-ended input means coupled to the single-ended receive means, and a single-ended output means, wherein the automatic gain control amplifier means is configured to receive an automatic gain control signal;

a single-ended first filtering means coupled to the automatic gain control means; and

a single-ended second filtering means coupled to the transmit means for filtering the single-ended output signal before conversion to the differential output signal for transmission on the twisted pair telephone line.

78.-83. (Cancelled)

84. (Currently Amended) The analog front end of claim [[83]] 77, wherein the automatic gain control amplifier means comprises variable attenuation means for attenuating the single-ended input signal.

85. (Currently Amended) The analog front end of claim 84, wherein the variable attenuation means comprises a voltage controlled resistor.

86. (Currently Amended) The analog front end of claim 85, wherein the voltage controlled resistor comprises a field effect transistor.

87. (Currently Amended) The analog front end of claim 86, wherein the field effect transistor comprises a first part coupled to the automatic gain control amplifier means, a second part coupled to a bias voltage, and a gate configured to receive a voltage to control the attenuation of the single-ended input signal.

88. (Currently Amended) The analog front end of claim 87, wherein the first part of the field effect transistor comprises a drain and the second part of the field effect resistor comprises a source.

89.-93. (Cancelled)

94. (Currently Amended) A method of interfacing to a twisted pair telephone line in digital subscriber line (DSL) modem, comprising:

receiving a differential input signal from a twisted pair telephone line;

converting the differential input signal to a single-ended input signal;

~~adjusting the gain of~~ amplifying the single-ended input signal;

filtering the single-ended input signal;

filtering a single-ended output signal;

converting the filtered single-ended output signal to a differential output signal; and

transmitting the differential output signal over the twisted pair telephone line.

95. (Currently Amended) The method of claim 94, further comprising filtering and amplifying the single-ended output signal.

96. (Currently Amended) The method of claim 94, further comprising filtering ~~and amplifying~~ the single-ended input signal.

97. (Currently Amended) The method of claim 96, ~~further comprising~~ wherein the amplifying step comprises amplifying the single-ended input signal with automatic gain control.

98. (Currently Amended) The method of claim 97, wherein the ~~automatic gain control~~ amplifying step comprises attenuating the single-ended input signal.

99. (Currently Amended) The method of claim 97, wherein the attenuation is performed with a voltage controlled resistor.

100. (Currently Amended) The method of claim 99, wherein the voltage controlled resistor comprises a field effect transistor.

101.-110. (Cancelled)

111. (New) The method of claim 97, wherein the amplifying step is performed with an automatic gain control amplifier, further comprising:

adjusting the gain of the automatic gain control amplifier.

112. (New) The analog front end of claim 59, wherein the converter comprises a two-way terminal coupled to the receive and transmit channels.

113. (New) The analog front end of claim 59, wherein the converter comprises a transformer having a single secondary winding.

114. (New) The analog front end of claim 113, wherein the secondary winding is grounded at one end.

115. (New) The analog front end of claim 114, wherein the secondary winding comprises a two-way terminal at another end, the two-way terminal being coupled to the receive and transmit channels.

116. (New) The analog front end of claim 59, wherein the receive channel comprises a line driver in combination with a filter.

117. (New) The analog front end of claim 59, wherein the transmit channel comprises a line driver in combination with a filter.

118. (New) The analog front end of claim 59, wherein the receive channel comprises an echo canceller.

119. (New) The analog front end of claim 118, wherein the echo canceller is responsive to the single-ended input signal and the single-ended output signal.

120. (New) The analog front end of claim 119, wherein the echo canceller comprises a comparator configured to compare the single-ended input signal and the single-ended output signal.

121. (New) The analog front end of claim 59, further comprising a filter disposed between the twisted pair telephone line and the converter, the filter having a plurality of components each having a breakdown voltage level sufficient to withstand lightning.

122. (New) The analog front end of claim 121, wherein the plurality of components comprises a plurality of series capacitors and shunt inductors.

123. (New) The analog front end of claim 77, wherein the receive means comprises means for amplifying and filtering the single-ended input signal.

124. (New) The analog front end of claim 77, wherein the transmit means comprises means for amplifying and filtering the single-ended output signal.

125. (New) The analog front end of claim 77, wherein the receive means comprises distortion reduction means for reducing distortion.

126. (New) The analog front end of claim 125, wherein the distortion reduction means comprises an echo canceller.

127. (New) The analog front end of claim 125, wherein the distortion reduction means comprises an amplifier having automatic gain control.

128. (New) The analog front end of claim 77, wherein the receive means comprises echo cancellation means for cancelling an echo on the single-ended input signal.

129. (New) The analog front end of claim 128, wherein the echo cancellation means is responsive to the single-ended input signal and the single-ended output signal.

130. (New) The analog front end of claim 129, wherein the echo cancellation means comprises means for comparing the single-ended input signal and the single-ended output signal.

131. (New) The analog front end of claim 77, further comprising a plurality of components disposed between the twisted pair telephone line and the converter means, the components each having a breakdown voltage level sufficient to withstand lightning.

132. (New) The analog front end of claim 131, wherein the components comprises a plurality of series capacitors and shunt inductors.

133. (New) The method of claim 94, further comprising processing the single-ended input signal to reduce distortion.

134. (New) The method of claim 133, wherein the processing is performed with an echo canceller.

135. (New) The method of claim 134, wherein the echo canceller comprises a comparator.

136. (New) The method of claim 94, further comprising filtering the differential input signal with a plurality of components each having a breakdown voltage level sufficient to withstand lightning.

137. (New) The method of claim 136, wherein the plurality of components comprises a plurality of series capacitors and shunt inductors.